





CENTRAL BRITISH AMERICA — PHYSICAL ASPECTS AND NATURAL RESOURCES.

EXTRACTS FROM THE PUBLICATIONS OF MR. J. W. TAYLOR, U. S.
CONSUL, AT WINNIPEG, MANITOBA.

*Appendix to Report of Hon. M. Goulet, Minister of Agriculture
for the Legislature of Manitoba, May 17, 1881.*

In presenting the first departmental report to the public, it has been deemed not improper to take advantage of such information as was available from reliable sources, and in this respect the following extracts, from the publications of Mr. J. W. Taylor, U. S. Consul, at Winnipeg, will be found very interesting to the general public, not only because of their historical value, but also in consideration of their usefulness as embodying the candid opinion of a gentleman whose scientific research and knowledge of the prime conditions effecting the agriculture of this continent have been fully recognized by his own government.

In the choice of the papers which follow, it has been thought expedient to observe a historical sequence, first giving an extract from Mr. Taylor's earliest publication in 1856, while a resident of Ohio; secondly, his personal impressions in 1860, when he had become a citizen of Minnesota and had visited the Selkirk settlement, and finally his latest and most fully considered opinions in 1879, after a long official residence at Winnipeg as consul, and when every opportunity had been sought and utilized to obtain the most ample and authentic information. In the progress of the present republication a few notes of explanation have been supplied by Mr. Alex. Begg, with whose assistance the following papers have been selected and arranged.

I.

THE SASKATCHEWAN DISTRICT.

Extract from a "Geographical Memoir of a District of North America extending from Latitude 43 Deg. 30 Min. to 54 Deg., and between Lakes Superior and Winnipeg and the Pacific Ocean," Printed at Columbus, Ohio, in 1856:—

* * * I have thus compiled from the few sources within my reach the materials for an opinion of the natural features and capacities of the Upper Missouri and Saskatchewan Districts of North America, and I can best illustrate my own conclusions in the premises by a comparison with a similar area of European Russia. Draw a line from St. Petersburg twenty de-

degrees east and another ten degrees south, extending them in the form of a parallelogram and a region is described whose area corresponds with that between Lakes Superior and Winnipeg on one side and the Rocky Mountains on the west, and extending from latitude 44° to 54° . No two sections of the respective continents more closely resemble each other than do those above delineated. Both are immense plains, developing the silurian, carboniferous, and in some measure cretaceous geological formations: the Missouri, Mississippi and Saskatchewan may be set off against the Dnieper, the Don and the Volga of Russia, while in respect to climate and productions the American district resembles the following particulars of European Russia.

It is usual to consider Russia in Europe in four distinct divisions:—A polar region including all the country north of latitude 67° ; a cold region extending from 67° to 57° ; a temperate region from 57° to 60° , and a warm region from 50° to 57° . Our continental latitude from 44° to 54° represents the Russian temperate zone from 50° to 57° , as well as three degrees of the cold division, namely to the latitude of St. Petersburg or 60° north.

The temperate region of Russia has a mean annual temperature of from 40° to 50° , and includes within it the finest and most populous portion of the empire, though even here the thermometer has a very wide range—the summer heat, which suffices to grow melons and similar fruits in the open fields, being often succeeded by very rigorous winters. Even the Sea of Azof, much farther south, usually freezes about the beginning of November, and is seldom open before the beginning of April. The oak is seldom found below latitude 61° ; few fruit trees are found beyond 56° , and their regular culture cannot be profitably carried on north of the 53^{rd} parallel. In this latitude (still speaking of Russia) apples, pears and plums become abundant; and still farther south peaches, apricots, &c., flourish. The northern limit of rye is 65° , of barley 67° , and oats even farther north.

Wheat is cultivated in Norway to Drontheim, latitude 64° ; in Sweden to latitude 62° ; in Western Russia to the environs of St. Petersburg, lat. $60^{\circ} 15'$; while in Central Russia the limit of cultivation appears to coincide with the parallel of 58° or 59° . It is well understood that the growth of the cerealia and of the most useful vegetables depends chiefly on the intensity and duration of the summer heats, and is comparatively little influenced by the severity of the winter cold or the lowness of the mean temperature of the year. In Russia, as well as in Central America, the summer heats are as remarkable as the winter cold. The northern shore of Lake Huron has the mean summer heat of Bordeaux, in Southern France, or 70° Fahrenheit, and Cumberland House, on the Saskatchewan, exceeds in this respect Brussels or Paris. It is remarked by Sir John Richardson (and such also is the analogy of Russian

Europe) that the prairies south of 55 enjoy milder winters than the more eastern districts.

I have no doubt that potatoes and the hardier garden vegetables can be profitably cultivated as far north as 54 in the Saskatchewan district; that wheat and such fruits as yield cider are safe as far as 52; and that maize may be cultivated at least to lat. 50; while the country between 44 and 51 is as nearly as possible the counterpart of the south temperate zone, of European Russia.* With the same system of canalage, and a reasonable degree of railroad connection, our vast northern plain can sustain as dense (and with our institutions and land tenures a denser) population than the heart of the Russian Empire.

Its capacity to support life is shown by the variety and abundance of wild animals. Many of these might be domesticated and would constitute a great resource. Besides innumerable furbearing creatures, there are four different kinds of deer: the Cariboo, or reindeer, ranges from 50 to 66; the Rocky Mountain goat, whose wool is highly prized in the manufacture of shawls, frequents the highlands from 40 to 60; the bison swarms in the prairies west of longitude 105 and south of latitude 60, and the streams and lakes abound in choice varieties of fish. No region of the globe is more richly endowed with these allies and slaves of the human race.

The rigorous winter climate is no obstacle to the future occupation of these northern plains. The corresponding district of Russia with the same climate is, as already shown, the most populous and flourishing portion of the empire. There is much misapprehension on this subject. Mr. E. Merriam (a distinguished meteorologist) states in a review of recent Arctic expeditions, that Nature has qualified man to breathe an atmosphere 120° above zero, or 60° below it, a difference of 180° , without injury to health, and the dogma that great and sudden changes of temperature are injurious to health is disproved by recorded facts.

But there is another aspect of this climatic question which is not unworthy of consideration. Scotland, Norway and Sweden, and even Iceland, have fully reached the general civilization of Christendom, and is it not the case that the hyperborean climate of these countries constitutes a valuable agency in forming the social and domestic character of the people? With them Home becomes a word of vital significance, the family is lifted to the front rank of human institutions, and the national life and literature gain

*At the time of this publication, Mr. Taylor was evidently not in possession of the facts, so prominently presented by him on subsequent occasions, that the North Saskatchewan and Peace River districts carried the limits of successful agriculture far beyond the above statement, which may be assumed to be the range of cultivation on the longitude of Winnipeg—wheat near the Rocky Mountains reaching its greatest perfection in latitude 58, while rye, barley and oats mature with extraordinary returns at 60 and beyond.

incalculably from household influences. A sound mind in a sound body is another consequence of a stern climate—Nature's obvious compensation for the exposure of those who dwell under the frigid sceptre of the Ice-King—within the Arctic clamors of rude Boreas.

Indulge me in a brief recapitulation :

1. Between latitude 43 deg. 30 min. and 49 deg., and west of the meridian of St. Paul to the Pacific Ocean, the great American desert is reduced to a narrow and insignificant spur along the base of the Black Hills, but in place of its sterile sands and the extreme breadth of the Rocky Mountain plateaux, we meet beyond the well and favorably known area of Minnesota, first the marly margins of the middle Missouri, southward from its great northern bend ; next the fertile plains of the Yellowstone and Upper Missouri ; then the favorable passes of the Rocky Mountains with their transverse and beautiful valleys ; beyond that barrier, the basin of the Columbia eminently suitable for grazing ; and finally the humid and productive border of the Pacific Ocean—a region destined to be organized into at least ten States, none of them as small as Ohio, and several transcending the proportions of Missouri.

2. The population and resources of the communities which must inevitably arise along the national boundary, will be the surest guarantee for a railroad between Lake Superior and Puget Sound, although it is highly probable that its extension beyond the Missouri River must accompany and not entirely precede the systematic settlement along the proposed route.

3. But tributary to that great enterprise, when the conditions for its execution shall be matured, and meanwhile to the river and lake transportation of the United States is the extensive and hitherto unexplored Saskatchewan plain—an area ample for four large States—with a soil of extraordinary fertility and summers long enough to mature all the hardy cereals and fruits—thronged by fur-bearing animals and those nobler genera which only need to be reclaimed to constitute an immense source of wealth and comfort—skirted and perhaps traversed by coal deposits, compensating for any possible deficiency of forests—in short, a region of health and physical development which we are not at liberty to doom to sterility and solitude with the analogies of European geography and history so clearly indicating a hardy and populous settlement of this American Scandinavia at no distant period of time.

4. To this glimpse, present and prospective, of the geographical zone which clasps the Columbia, the Upper Missouri and Mississippi, and the Saskatchewan, we might push the analogy to the physical geography of the Old World even farther, and show how England, Norway, and Upper Germany correspond to Vancouver

Island and the main land of Oregon, Washington, and New Caledonia—how ten degrees of European Russia, as already illustrated, find their equivalent east of the Rocky Mountains and north of latitude 44—while the bleak primary wastes of Labrador and the region of Canada beyond the ameliorating influence of the Lakes and the Gulf Stream is not unlike Siberia, and thus complete the parallel between the two (*not three*) continents of the northern hemisphere.*

II.

RELATIONS OF MINNESOTA AND NORTHWEST BRITISH AMERICA.—
A REPORT TO THE GOVERNOR OF MINNESOTA.

ST. PAUL, March 3, 1860.

HON. ALEXANDER RAMSEY,
Governor of Minnesota:

On the 18th of June, 1859, I received from Hon. Henry H. Sibley, Governor of Minnesota, a communication, requesting me to obtain, in the course of a visit to the Selkirk Settlement "reliable information, relative to the physical aspects and other facts connected with the British Possessions on the line of the overland route from Pembina via the Red River settlement and the Saskatchewan Valley to Frazer River," and to communicate the same to the executive department in a form suitable for submission to the legislature.†

*As before intimated, this memoir was written and published before Mr. Taylor had become a citizen of the North-West. He had been engaged upon a history of Ohio, with special reference to its Indian and French occupation—a first period, in advance of its organization as a Territory in 1787—and the authorities requisite to that enquiry led to an investigation of the features and resources of the region now known—not as the "North-West Territory of the United States" resting on the Ohio River—but as the "North-West Territory of Canada," embracing the great northern rivers of the Saskatchewan, Athabasca, Peace, and Mackenzie.—A. B.

†The summer of 1859, or the period of Mr. Taylor's visit to Selkirk Settlement, will long be remembered as the era of steamboat navigation on Red River. In 1857, a committee of the House of Commons, after an elaborate enquiry, pronounced the Red River and Saskatchewan districts as desirable for colonisation; in 1858, the gold discovery of Frazer River occurred, and Mr. Taylor and other citizens of St. Paul, connected with a railroad project to Pembina, prosecuted a vigorous agitation in favor of an overland emigrant route from St. Paul, via Fort Garry and the Saskatchewan Valley, to the gold fields in the interior of New Caledonia, now British Columbia. Numerous public meetings were held in St. Paul, legislative and other reports were published, and at length measures were taken to transfer a steamer from the upper waters of the Mississippi and reconstruct the vessel for the Red River navigation. A connection by stage coaches with the steamers at Fort Abernombie was effected, and an immense impulse to overland communication was given. A. B.

At the Selkirk Settlement upon the Red River of the North, the introduction of Gov. Sibley was duly honored by Hon. Wm. McTavish, Governor of Assiniboia. The settlement upon the Red River, from the international boundary, at Pembina, to the mouth of the river, in Lake Winnipeg and upon the Assiniboine River, for a distance of sixty miles west of its junction with the Red River at Fort Garry, have acquired a civil organization, under appointments of the Hudson Bay Company, which is officially designated as "The Colony of Assiniboia." I desire to acknowledge the uniform courtesy and solicitude to communicate the information sought by me, not only of Gov. McTavish, but of Dr. J. Bunn, John E. Harriott, Esq., Thomas Sinclair, Esq., and Robert Macbeth, Esq., gentlemen holding the appointments of legislative councillors and magistrates of the colony of Assiniboia.

The first Territorial Librarian of Minnesota, Charles Cavilleer, Esq. and Hon. N. W. Kittson, late Mayor of St. Paul, are now residents of St. Boniface, the seat of the Catholic Episcopate, opposite Fort Garry; and I am greatly indebted for their suggestions. The historical collections of D. Gunn, Esq., correspondent of the Smithsonian Institute, were accessible by me.

I shall have occasion, also, in the progress of this report, to produce the testimony of Bishop Tache, of the Catholic Church, and of Bishop Anderson and Archdeacon Hunter, of the Church of England. To them and others of the clergy of Selkirk, I would express obligations for valuable information.

It is unnecessary to repeat the narrative of Lord Selkirk's remarkable colonization of Red River. Of the present community of ten thousand souls, about five thousand are competent, at this moment, to assume any civil or social responsibility, which may be imposed upon them. The accumulations from the fur trade during fifty years, with few excitements or opportunities of expenditure, have secured general prosperity, with frequent instances of affluence; while the numerous churches and schools sustain a high standard of morality and intelligence.

The people of Selkirk fully appreciate the advantages of communication with the Mississippi River and Lake Superior, through the state of Minnesota. They are anxious for the utmost facilities of trade and intercourse. The navigation of the Red River by a steamboat during the summer of 1859 was universally recognized as marking a new era in their annals. This public sentiment was pithily expressed by the remark, "In 1851, the governor of Minnesota visited us; in 1859 comes a steamboat, and ten years more will bring a railroad!"

I was gratified to find that the Hudson Bay Company was no exception to the general feeling of cordiality. Gov. Sibley was apprehensive with the prospect of greatly increased intercourse by the channel of Red River, that American traders and emigrants

might be received inhospitably, but no such disposition was shown; and as to the enterprize of steam navigation, it is now understood, that the Hudson Bay Company has become an active party in its future prosecution.

The population of Selkirk, unconnected with the company, is so numerous and influential that all restrictions of trade have been relinquished. Most amicable relations exist between the trading post at Fort Garry and Kittson's station, at St. Boniface. Goods are charged with an impost of four per cent., whether brought from Europe or the United States, which constitutes the revenue of the colony of Assiniboia. Land can be purchased by anyone at seven shillings sterling per acre, with liberal credits and low interest.

For the present, the jurisdiction of the country is exclusively that of the Hudson Bay Company. There is a probability, however, that representative institutions will be established by an act of the current English Parliament. Letters from London were shown to me in August—particularly a communication from Prof. Isbister, of London, to Donald Gunn, Esq., of Lower Fort Garry—which stated that one of the latest official acts of Sir Edward Bulwer Lytton, before his retirement from the office of colonial secretary, was to draft and circulate for the consideration of members of Parliament, a bill providing for the organization of a colony, which should embrace the district extending from Lake Superior and Winnipeg to the Rocky Mountains, and bounded north by latitude 55. Its passage was only prevented by the resignation of the Derby ministry, and I notice that Bishop Anderson, in a recent charge to the clergy of his diocese, expresses great confidence that Sir Edward's successor in the Colonial office, the Duke of Newcastle, "whose attention has for many years been directed to this subject, will be prepared, ere long, with a comprehensive measure of the same character."

The physical geography of the vast interior districts, which constitute the basin of Lake Winnipeg, will soon be as familiar as that of the territory of the United States within the same lines of longitude. The Canadian Government has lately published the result of an exploration of the channels and valleys of the Red and Assiniboine Rivers. The London Geographical Society has given to the world the narratives of Capt. Palliser and his associates, who have thoroughly explored the vicinity and passes of the Rocky Mountains, between latitudes 49° and 54°. Intelligent parties, organized for hunting adventure or overland transit, are making constant additions to the public knowledge of North-West America. A citizen of Minnesota, Col. William H. Noble, whose name is the designation of the most practicable pass of the Sierra Nevada, discovered by him in 1851, has turned his attention since the gold discovery of British Columbia, to the details of an overland emigration route, by the valleys of the Red River of

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the North, the South Saskatchewan and the Kootenais Pass. An exploration conducted by him in the summer of 1859 to Fort Ellice on the western sources of the Assiniboine, was very satisfactory, and its results will be published as soon as a report by J. W. Hamilton, Esq., who conducted the same party of exploration from Fort Ellice through the Rocky Mountains, shall be received.

Upon the general topic suggested by Gov. Sibley of communications between Minnesota and Central British America, whether considered in regard to transportation from that extensive district to Lake Superior and the Mississippi River, or in regard to a western connection with the Pacific coast, I beg leave to submit the following results of recent observation and enquiry:

1. The navigable capacity of the Red River of the North may be comparatively stated as follows: Ascending the stream from Lake Winnipeg, the navigation to Pembina is equal to that of the Mississippi between Prairie du Chien and Lake Pepin; from Pembina to the mouth of the Red Lake River, the channel may be compared to the Mississippi from Red Wing to Fort Snelling; from Red Lake River to Shaysenne to the Minnesota from Fort Snelling to Shakopee; and from Shaysenne to Breckenridge, to the Minnesota from Shakopee to Fort Ridgley. The Red River is navigable above (south of) Pembina 400 miles, while the distance from the international line by the river to Lake Winnipeg is 175 miles. Total distance navigable by steamers, 575 miles. To this add 350 miles for the navigation of the Shaysenne, Red Lake River and Assiniboine (its principal tributaries) and the Red River coast of the Red River valley, accessible by steamers, will be found to exceed nine hundred miles.

2. Lake Winnipeg is about two hundred and fifty miles in length, but of unequal breadth. Its area cannot be less than that of Lake Erie, but is far more diversified by islands and headlands. The western bank is alluvial, resting on limestone, while the numerous bays of its eastern shore develop the gneiss, granite and trap rock of the primary formation. The lake is not deep, but with no shallows obstructive to navigation.

3. From a point near the northwestern angle of Lake Winnipeg, the great navigable channel of the Saskatchewan, divided into arms at latitude 53° and longitude 106° , may be ascended by steamers to Fort Edmonton on the north branch, and to Chesterfield House or Old Bow Fort on the south branch, in close proximity to the Rocky Mountains. The rapids of the Saskatchewan, near the mouth of the river, can hardly be said to interrupt navigation. Open loaded boats have been tracked (drawn with a rope by men on shore) over the most violent portions of the rapids, the respective distances being one mile and a quarter of a mile, while, for

descending vessels, there is no difficulty. Loaded boats run the rapids with safety at every stage of water.

4. When Central British America is fully recognized as a colony of England, its interior navigation can be greatly facilitated by canals between the channels of the Assiniboine and the South Saskatchewan, and connecting Lakes Winnipegosis and Manitoba with the Saskatchewan west of the rapids; but with the present natural advantages of the country, it is easy to perceive that steam navigation will greatly contribute to the enterprise of an overland communication from Minnesota to British Columbia, and, what is of more importance to the State, will bring an immense and fertile district, whose colonization can be no longer postponed, into profitable connection with the public thoroughfares of Minnesota.

5. The testimony of John E. Harriott, Esq., Archdeacon Hunter, Bishop Tache and others was explicit, that the country on the north branch of the Saskatchewan is superior for the purpose of agriculture, to the plains of the South Saskatchewan. The latter are destitute of timber, except on a range of elevations near the international boundary, and partake of the cretaceous formation apparent on the Upper Missouri. The regions adjacent to Fort Pelly, Carlton House, Fort Pitt and Edmonton House—well known points in a general northwestern direction from Fort Garry—are remarkably adapted to the cultivation of grain and the sustenance of cattle. The scenery of the North Saskatchewan is fully equal to that of the Mississippi between Galena and the Falls of St. Anthony.

6. The limit of successful agriculture in the Northern Temperate Zone should be carried considerably beyond the Saskatchewan valley, especially near the Rocky Mountains. Sir Roderick Murchison, in a recent address before the London Geographical Society, represents this chain of mountains to be greatly depressed in high northern latitudes, and, indeed, several of the tributaries of the Mackenzie have their sources on the Pacific slope, and wind through the mountains before falling into the great Arctic river. The mountain valleys of the Peace and Liard rivers, from latitudes 56° to 60° , are thus influenced by the Pacific winds, and wheat, with other cereals, is successfully cultivated.

7. The present agriculture confirms the evidence from a variety of sources, that the districts west and northwest of the Red River Valley, are well adapted to settlement. For the production of wheat, barley, rye, oats, peas, potatoes, grass, whatever is grown in Minnesota, except maize, the region will be unsurpassed by any other area of similar extent on the continent.

The foregoing are material considerations. Closely related to these is a topic of a political character. With the extension of the

British colonial system, now seen to be imminent, there is reason to believe that the governments of England and the United States will consummate the recent settlement of the prolonged dispute in Central America, by an adjustment of the future relations of the British Provinces and American States, upon a basis of mutual interest and good will. Such an international compact might provide for a custom and postal union between the Provinces and the United States. It should, at all events, stipulate that the Reciprocity Treaty, enlarged in its provisions, and renewed for a long period of years, shall be extended to the Pacific Ocean, and, in connection therewith, all laws discriminating between American and foreign-built vessels should be abolished, establishing freedom of navigation on all the intermediate rivers of the respective territories. Such a policy of free trade and navigation with British America would give to the United States, and especially to the Western States, all the commercial advantages, without the political embarrassments of annexation, and would, in the sure progress of events, relieve our extended northern frontier from the horrors and injuries of war between fraternal communities.

Who can doubt that it would be speedily followed by overland mails and the telegraph on the Pembina and Saskatchewan route, and a continental railroad, as advocated by Maury, which England would recognize as essential to her interests in North-West America and the Pacific coast?

The above is intended as an enumeration, by no means as an exposition of our relations to Central British America. I shall close this communication with some notes, equally cursory, upon Northern Minnesota.

1. The steamboat navigation of the Red River of the North will be regular during the summer of 1860. The *Arison Northrop* is in course of thorough repair and equipment. Arrangements are also in progress for additional steamers upon Red River and Lake Winnipeg.

2. It is hoped and presumed that a weekly mail to Pembina will be conceded by the government of the United States. The authorities of Assiniboia will cheerfully contribute to the expenditure requisite for such a mail service.

3. The legislature of Minnesota having, at the present session, adopted memorials to the executive and legislative department, at Washington, in favor of a military post in the valley of the Pembina River, and for the extinction of the Indian title in the northwest portion of Minnesota—I shall not enlarge upon those topics.

4. My return trip from Pembina was over the probable extension of the branch line of the Minnesota & Pacific R. R., by way of the crossing of the Red Lake River, Detroit Lake and Otter Tail Lake

to Crow Wing. For the first eighty miles of this route, from Pembina to the rapids, which limit steambōat navigation from the mouth of Red Lake River, the trail follows a ridge, as distinctly defined as the formations south of Lakes Erie and Ontario, over which pass the well-known "Ridge Roads." The forests surrounding Red Lake are destined to furnish large quantities of pine lumber to the Red River settlements.

5. On the subject of coal deposits, while no doubt exists that the sources of the Saskatchewan traverse an extensive coal field, it is yet uncertain whether the upland district, which separates the basis of the Minnesota and the Red River of the North from those of the upper Missouri and the Saskatchewan, are carboniferous. By all geological analogy, a coal formation should exist between the silurian system of Minnesota and Selkirk, and the cretaceous plateau, which Nicollet identified on the Missouri, due west from St. Paul, and which Prof. Hinde, of the Canadian exploration, traced along the same longitude as far north as latitude 50°.

6. The allusion just made to the exploring expedition, conducted under the authority of Canada, justifies a tribute to the zeal and intelligence with which the enterprise of an emigrant and transportation route from Fort William, on the north shore of Lake Superior to Fort Garry, is prosecuted. With the civil organization of Central British America, a wagon road between those points, to be followed by a railroad, will receive all requisite encouragement, certainly from the Canadian treasury, and perhaps by the efficient co-operation of the home government. The North-West Transit Company, acting under a Canadian charter, but understood to have enlisted London capitalists, is expected to resume operations during the summer of 1860. These movements of our Provincial neighbors cannot fail to influence the policy of Minnesota in favor of more satisfactory communications than we now possess between Lake Superior and the channels of the upper Mississippi and the Red River of the north.

I desire, in conclusion, to express my obligations to the late Executive of Minnesota for the confidence implied by the commission to which the foregoing is a response. Believing firmly that the prosperity and development of this State is intimately associated with the destiny of North-West British America, I am gratified to record the rapid concurrence of events which indicate that the frontier, hitherto resting upon the sources of the St. Lawrence and the Mississippi is soon to be pushed far beyond the international boundary by the march of Anglo-Saxon civilization.

III.

CLIMATE AND CAPACITY FOR SETTLEMENT OF CENTRAL CANADA.

Extract from Consular Report of June 30, 1879, on "Commercial Relations," Published by U. S. State Department:—

* * * All recent information confirms my former impressions that an area as large as four States of the size of Minnesota, with equal capacity for the production of grain and animals, extends west of Lake Superior to the Rocky Mountains, and from latitude 49° (the international boundary) to latitude 55° due north of Winnipeg, and to latitude 60° near the Rocky Mountains. Careful meteorological returns show that the season of vegetation (from April to August inclusive) at Battleford, on the Saskatchewan River, 1,200 miles northwest of St. Paul, is warmer than at Toronto. I repeat this comparison, including observations at St. Paul and Winnipeg:

LOCALITY.	LAT.	LONG.	MEAN TEMP.
Toronto.....	44	79	$57^{\circ}.65$
St. Paul.....	45	93	$65^{\circ}.05$
Winnipeg.....	50	97	$58^{\circ}.19$
Battleford.....	53	109	$58^{\circ}.53$

Thus it will be seen that the climate in its relation to agriculture is warmer in Manitoba and over territory 700 miles northwest than in the most central districts of Eastern Canada, while St. Paul, in latitude 45, is 7 deg. 40-min. warmer than the vicinity of Toronto in latitude 44° .

I am informed that observations at Fort McMurray, on the Athabasca River and Fort Vermillion on Peace River—latitudes 57° and 59° —exhibit the climate at these points as not materially different from Battleford. The altitude of the Athabasca and Peace River Districts is less, and the trend of the Pacific winds through the Rocky Mountains is more marked than at Battleford. It was on the banks of Peace River, well up to latitude 60° , that Sir Alexander Mackenzie records, on the 10th of May, the grass so well grown that buffalo, attended by their young, were cropping the uplands.

But I find my best illustration that the climate is not materially different west of Lake Athabasca, in latitude 60° , than is experienced west of Lake Superior, in latitude 47° , in some personal observations of the northwestern extension of wheat cultivation. A leading manufacturer of flour in Minnesota visited Manitoba, seeking a charge of seed, the wheat grown in his neighborhood having lost its flinty texture. He found the quality he desired, but the yield astonished him. He found three well-formed

grains in each group or cluster forming the ear; while in southern Minnesota the rule is two grains; and I have since received heads of wheat from Prince Albert, a Saskatchewan settlement in latitude 53 deg., longitude 106 deg., and from Fort Vermillion, on Peace River, latitude 59 deg., longitude 108 deg., from each cluster of which I separated five well-formed grains. In the most remote locality—as far northwest of St. Paul as Norfolk, in Virginia, is southeast, the perfection of the wheat plant is attained in pursuance of the well-known physical law, that the greatest yield of a plant is near the northernmost limit of its successful growth. I will also state, as a further climatic illustration, that at Fort Vermillion, cucumber seed, planted in the open ground in May, matured fruit on the 20th of August.

The foregoing statements are confirmed, or were rather anticipated, by the testimony of Blodgett's Climatology of North America, as follows:—"A line drawn from Thunder Bay, on Lake Superior, northwest to the Mackenzie River, at the 60th parallel, and from that point to the Pacific coast at the 55th parallel, would include an immense district adapted to wheat." Mr. J. A. Wheelock, first commissioner of statistics in Minnesota, said, long since, "Minnesota and the country northwest of it, is the best wheat district, having the largest average yield, the most certain crops, and the best and healthiest grains," and quite recently the latter authority has recorded the opinion that "in the Hudson Bay territory, outside of the old Provinces 200,000,000 acres are adapted to wheat raising."

Over the whole of this extensive district the conditions are equally favorable to the production of domestic animals. The climate gives health and weight; the grasses preserve their nutritious qualities through winter, being north of the permanent snow line; hay of the best quality can be cheaply secured; and the necessity of feeding cattle is the same in Missouri and Illinois as in the Red River valley. Sheep, when dressed for market, often weigh 80 pounds, occasionally 100 pounds, with increased weight and fineness of the wool, while as to horses, it seems incredible that they find their only and ample sustenance upon native grasses. The buffalo and horse toss and paw the snow till the grass is reached—an instinct which cattle have hardly developed. I am fully impressed, by the evidence, that the whole territory above described is destined to produce vast herds of cattle, superior in weight and quality to animals of lower latitudes. Grain and cattle, bread and meat, will be the great staples of the Winnipeg basin.

In this connection, I should not omit to add that the localities of Central Canada already mentioned on the line 1600 miles northwest of St. Paul—Battleford, Prince Albert, Fort McMurray, Fort Vermillion, including the better known Fort Edmonton, are all

west of longitude 105°, and are in direct range with Denver City, Great Salt Lake and even Virginia City, yet at none of the more northern positions is there any necessity of irrigation. It is the crowning feature of the "Fertile Belt" which broadens with reduced altitudes and constant air currents from the Pacific coast; that the immense trapezoid, whose apex is bounded on the Mackenzie, has a sufficient quantity of summer rains for all the purposes of agriculture, as organized in the Atlantic and Mississippi States.

I regard this region as a geographical division of the Mississippi Valley. Geologists are of the opinion that in a primeval epoch the whole Red River basin was an extension of Lake Winnipeg, with the Saskatchewan River for its inlet and the Minnesota and Mississippi rivers for its outlet to the Gulf of Mexico; and from the Gulf to the Arctic Ocean, along the trough of greatest depression, the only elevation over 800 feet is upon the narrow divide of waters in Northern Minnesota. Of this general direction are the prevalent winds—a flow almost tidal in the regularity of movement from south to north or reversely. With the developments of civilized occupation a great natural commerce must follow: the exchanges between the cotton zone of the Southern States, the corn zone verging upon the shores of the great lakes, and the wheat zone ranging as far north as in Europe. These exchanges of dissimilar products will, in all probability, constitute the bulk of the domestic trade of the interior of North America.*

IV.

COAL BEARING DISTRICTS OF NORTH AMERICA.

From the Canadian North-West, January, 1880:

In determining the districts in the comparatively unexplored west where, by physical analogies, coal-bearing measures are likely to be developed, it will be convenient to take for a starting point the Laurentides Hills, or the Laurentian chain of mountains.

*At a banquet to Messrs Reade and Pell, Imperial Agricultural Commissioners, given by the authorities of Manitoba, in October, 1879, Mr. Taylor referred to the coincidence of immigration on this continent with its great zones of production—parting into three columns of migration to the cotton, corn and wheat belts, the latter succeeding each other from north to south; and asserted that Northern Minnesota and Dakota were the southern border, and but a small proportion of the great central district, where the conditions of soil and climate concur to make wheat the leading agricultural staple. He also claimed that these northern districts would be equally pre-eminent for stock raising—a position to which Mr. Clare Reade in reply expressed his non-concurrence; but the same gentleman in a recent letter has reconsidered his opinion and admits that the most favorable region in the world for the cheap supply of bread and meat is in the high northern latitudes of this continent.—A. B.

They are described as a rugged range, with an average height of 1,300 feet, skirting the north bank of the St. Lawrence river, in the lower part of its course, and extending from Labrador to the vicinity of Quebec, where they leave the river, but still keep nearly parallel with it, until about thirty miles west of Montreal, when, skirting the Ottawa for about 100 miles, they cross it and curve round to near Kingston and into Northern New York, whence the range extends northwestward to the shores of Lakes Huron and Superior, which are skirted on the north. In the same general direction the Laurentian formation may be traced to the shores of the Arctic Ocean, along the eastern borders of the Lake of the Woods and Lakes Winnipeg, Athabasca, Great Deer, Great Slave and Great Bear. Constantly associated with the chrystalline, trappean and metamorphic rocks which characterize the Laurentides, long ridges of granite often intrude with many evidences of eruptive or igneous agencies. With their curved line of 3,000 miles, like a scymeter with the handle resting on the coast of Labrador, and the point touching the Arctic coast, on the eastern border of the interior basin of the Mackenzie river, they constitute a "plutonic chain," a "main axis of dislocation," to repeat terms used by Prof. David Dale Owen in his survey of northern Minnesota in 1850, from which southward and westward geologists trace the later sedimentary rocks, especially those fertile and valuable deposits of limestone, which are characterized as silurian and devonian.

Sir Roderick Murchison has frequently advanced the opinion that the productive gold districts of the world occur where the silurian, and perhaps the lower strata of devonian, rocks are in contact with, or have been penetrated by green stones, porphyries, serpentine, granitic and other rocks of the primary formation. Gold, especially when traced to its original matrix, is found to occur chiefly in veins or lodes of quartz rising from beneath and cutting through the secondary strata or beds of which the surface was previously composed. Indeed, as English explorers trace this contact of primary and silurian formations along the basins of the Lake of the Woods and Lakes Winnipeg, Athabasca and Slave and the channel of the Mackenzie river to the Arctic Ocean, it becomes an interesting problem for future solution whether the auriferous deposits of Alaska and British Columbia may not be extended with various degrees of productiveness along the flanks of the crest which separates the waters of the Gulf of Mexico and St. Lawrence from those of the Arctic Ocean and Hudson's Bay, quite as the discoveries of this century have followed the Ural mines eastward through Siberia to the Pacific.

But we must avoid digression. The general mineral wealth of the Laurentides is a fruitful topic, but its consideration must yield to the inquiry of their relation to coal-bearing districts.

Above the granitic intrusions of the Laurentian chain, although broken and tossed by volcanic upheaval and mineral infusions, geologists identify the earliest sedimentary formation—known as Cambrian—but closely following it are the silurian strata of Quebec, New England and New York, now classified into a dozen lithological groups, until we reach southeastwardly the chambers of the coal chiefly in the mines of Cape Breton and Nova Scotia, and partially in New Brunswick, while southwestwardly, hardly 300 miles distant from Montreal, the devonian or carboniferous formation of Pennsylvania, with its wealth of anthracite, is reached, and its development west of the Alleghanies, with less valuable deposits of bituminous coal, can be followed through Ohio, Kentucky and other districts of the Appalachian chain.

We have traced the Laurentides due northwest from Lake Superior, with a sharp angle of deflection from its eastern direction; but it may not generally be known that not far from Thunder Bay a granite cape plunges south west through Northern Minnesota and is visible above the drift of the glacial period at St. Cloud, Redwood, on the Upper Minnesota, and even to the north west angle of Iowa, at Sioux Falls. From this primary formation, with a general direction of south east, the bluffs of the Minnesota and Mississippi reveal the silurian strata of the New York geological survey, and after passing Illinois and Iowa we reach again the carboniferous formation. The analogy to the geological interval between the primary or Laurentian Adirondacks of Northern New York and the coal bed of the Alleghany range, has become satisfactorily established by Owen's survey; nor is the distant greater—about 300 miles on an air line in each case.

Let us push our geological analogies in another direction. How is it north and west? In the vicinity of Otter Tail Lake and on the rapids of the Red River of the north; Prof. D. D. Owens discovered ledges of limestone in place, containing fossils which he identified with the lower silurian rocks of New York and the magnesian limestone of the Mississippi bluffs, near St. Paul, while below Pembina other limestone rocks revealed fossils of a still later epoch, two degrees higher in the scale of Owen than the limestone ledges at St. Paul. "About twenty miles below (north of) the mouth of the Assiniboine," Owen informs us, "a considerable amount of rock has been quarried, containing fossils identically the same which occur in the lower part of F. 3 in Wisconsin and Iowa (the bluffs at St. Paul are F. 1 on the Professor's scale), in the blue limestone of Indiana, Ohio, Kentucky and Tennessee, and also in the lower silurian of Europe. The *coscinopora* is precisely the same as the coral which is particularly characteristic of the lower beds of the upper magnesian limestone of Wisconsin." I reproduce these observations of thirty years ago not for their novelty, but to illustrate more recent discoveries in the fertile belt of Central British America.

The extension of settlements to the Black Hills and of the Northern Pacific Railroad beyond the Missouri River, have developed immense beds of lignite coal—characteristic of the tertiary formation—and Canadian exploration has traced these beds north to the valley of the Souris or Mouse river, and thence westward near the international line to the Rocky Mountains, where they join the broader carboniferous formation which flanks the Rocky Mountains from New Mexico, in latitude 35 deg., to the mouth of the Mackenzie River, in latitude, 70 deg.

But between the silurian development of the Red River district and the immense Saskatchewan basin, and the cretaceous and tertiary formations, which contain these beds of lignite, where are the devonian rocks—the true coal measures? Can these be a total fault? It seems incredible; and with the progress of exploration and settlement, I shall confidently anticipate that they will be discovered and exploited for the coming population of the great northern interior of this continent.*

But, for the present, public attention is directed to the lignites of the west. In the vicinity of the Rocky Mountains they have long been noticed and described by travellers. The lignite beds of the Upper Missouri were noticed by Lewis & Clark, in 1803-4; those of the Laramie plains, now in Wyoming, by Fremont in 1842; those of the Raton Mountains, in New Mexico, by Gen. Emery, in 1848. Recurring to North West British America, Sir George Simpson, in his Overland Journey Around the World in 1841-2, describes "a seam of coal near Fort Edmonton ten feet deep, which had been traced for a considerable distance along both sides of the North Saskatchewan River." But the reader cannot fail to be interested in some notes of Sir John Richardson's observations and inquiries upon the subject of coal in the valleys of the Mackenzie and Peace Rivers. "The coal when recently extracted from its bed," he observes, "is massive, and most generally shows the woody structure distinctly. Different beds, and even different parts of the same bed, when traced to the distance of a few hundred yards, present examples of 'fibrous brown coal,' 'earth coal,' 'conchoidal brown coal' and 'trapezoidal brown coal.' Some of the beds have the external characters of a compact bitumen, but they generally exhibit on the cross fracture concentric layers, although from their jet-like composition the nature of the woody

*In corroboration of the foregoing theory of the presence of the true coal measures near the course of the Red River—probably in the "mountains" or first plateaux adjoining its alluvial and silurian plain—is the following paragraph in Mr. Taylor's Geographical Memoir (1856) first cited: "Henry B. Schoolcraft, in a communication to Silliman's Journal of Science (March 1855), refers to recent information of a reliable character, that on the western coast of the Lake of the Woods and south of the national boundary, large deposits of coal exist. If so, a corresponding formation unquestionably exists along the west shores of Lake Winnipeg." While this Report is passing through the press, there is much excitement at Emerson and vicinity in regard to a late coal discovery a few miles eastward.—A.B.

fibres cannot be detected by the microscope. Some pieces have a strong resemblance to charcoal in structure, color and lustre." In 1845, Sir John Richardson thus speaks of the Arctic slope of Central Canada in a communication published in the Journal of the Geographical Society. "These countries, explored by the expeditions of Sir John Franklin and Captain Back, are rich in minerals; inexhaustible coal fields skirt the Rocky Mountains through twelve degrees of latitude; beds of coal crop out to the surface on various parts of the Arctic coast, and the Mackenzie River flows through a well-wooded tract, skirted by metaliferous ranges of mountains, and offers no obstruction to steam navigation for upwards of 1,200 miles."

The Geographical Survey of Canada, now in progress under the direction of Mr. Selwyn, has reduced the imperfect testimony of travellers to a scientific certainty. In two successive reports Dr. G. M. Dawson has embodied valuable information in regard to the coal deposits of Vancouver Island, which extend to Bellingham Bay, Washington Territory, and quite recently, of Queen Charlotte's Island, which is also developed in the Aleutian Islands and probably on the mainland of Alaska. The coal in the latter localities is anthracite, while the deposits at Nanaimo, on the eastern coast of Vancouver and at Bellingham Bay, Washington Territory, are a superior quality of bituminous. San Francisco and California finding the Mt. Diablo deposit insufficient and inferior in quality, rely almost exclusively upon the mines at Nanaimo and Bellingham.

This paper should not close without some reference to recent intimations from Dr. Bell in regard to the geological indications north and east of the Laurentian chain. South and west we have ascended the geological horizon, until we have recognized more extensive formations of coal than the continent of Europe has disclosed; and all analogy would suggest similar formations with corresponding developments in the opposite directions. Such discoveries we now hear to be in reserve for us, when Dr. Bell's reports shall be fully published. The whole vicinity of Hudson's and James' Bay consists, in all probability, of extensive districts of silurian and devonian origin and characteristics, and if so, they will, like the equivalent regions of Northern Europe, be found rich in coal and iron, with sufficient capacity for agriculture to bring the new North East of the continent into the circle of the world's activities.